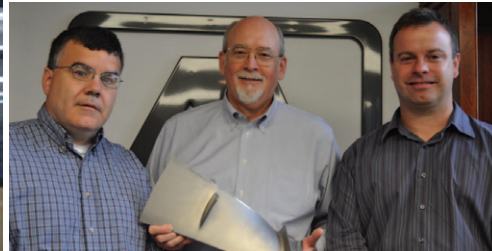
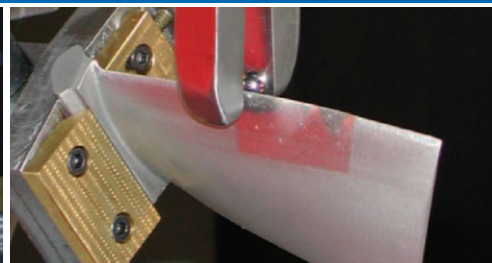
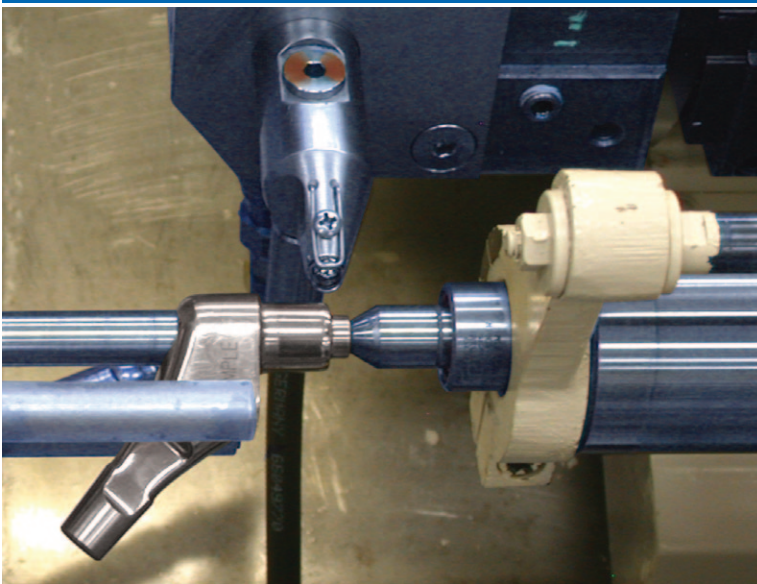


Award-Winning Technology Increases Durability and Life Span of Metal Components



(Left to right) Perry Mason, Paul Prev  , and Doug Hornbach — all of Lambda Technologies.

A partnership between NASA's Glenn Research Center and Lambda Research, Inc. (now part of the Lambda Technologies Group) has led to a new process—low plasticity burnishing (LPB[®])—that is providing extraordinary humanitarian and technological benefits. The LPB process improves the performance, strength, damage tolerance, and life span of metal components without changing either the material or the component design. The process is being used to repair and modify aircraft components, strengthen closure welds on nuclear waste containers, and eliminate fretting in hip implants. Research is also being performed to demonstrate LPB in manufacturing and repairing steam turbines, pipelines, and automotive components. LPB is currently in use by the U.S. Navy, U.S. Air Force, U.S. Department of Energy, Delta Airlines, U.S. Steel, and orthopedic equipment manufacturers across the nation.

LPB is a registered trademark of Lambda Technologies.

Benefits of Technology Transfer

- **Reduces aircraft maintenance and repair costs:** It is estimated that LPB will save the aircraft market over \$10 million for the mitigation of stress corrosion cracking on just one landing gear application.
- **Benefits patients with hip implants:** LPB has successfully eliminated fretting at the neck taper of hip implants, significantly reducing the need for painful and costly follow-up surgeries due to implant fatigue failure.
- **Increases safety of nuclear energy:** LPB was chosen over all other technologies by the U.S. Department of Energy to strengthen closure welds on nuclear waste containers designed for the Yucca Mountain facility.
- **Improves aircraft safety:** LPB has been applied to over 10,000 F402 engine vanes for the Naval Air Systems Command (NAVAIR), mitigating foreign object damage on the AV8-B Harrier.

On the Record

“Working with NASA, particularly during the initial demonstration phases for applying LPB to nickel-based alloys, has been extremely valuable in that it provided visibility for this technology in aircraft and aerospace-related forums. NASA’s support of LPB through its Web site has continued to encourage inquiries from industry, which have led to further commercialization.” — *Paul S. Prev  y III, Lambda Technologies, CEO and Director of Research*

“A NASA Glenn Small Business Innovation Research (SBIR) contract with Lambda Research led to the development of the low plasticity burnishing process. This cutting edge technology has successfully reached commercialization with uses in the aeronautics and biomedical industries, and in the federal government. It is helping to protect our armed forces and is making medical implants more durable.” — *Gynelle Steele, SBIR/STTR Program Manager*

About Lambda Technologies

Lambda Technologies of Cincinnati, Ohio develops surface treatments to solve fatigue and stress corrosion challenges. The company provides specialized expertise for the mitigation of fretting, foreign object damage, corrosion fatigue, and stress corrosion cracking.

Technology Origins

In the 1990s, NASA sought out innovative methods for increasing the thermal stability and life span of aerospace engine components that undergo extreme temperatures. Lambda Research had a patented but not fully tested method to address this challenge. Lambda’s research on shot peening and laser shock peening demonstrated that excessive amounts of cold work (i.e., working of metal at room temperature) reduced a material’s strength when exposed to extreme temperatures. Their new technique—low plasticity burnishing—produced a layer of compressive stress of high magnitude and depth, using very little cold working.

The Transfer Process

Glenn awarded Lambda an SBIR contract to demonstrate low plasticity burnishing as a means to increase the durability and life span of metal components. Through this partnership, Lambda developed the LPB process as a quick, convenient, and affordable way to produce surface compressive residual stresses that were much deeper than shot peening and much less expensive than laser shock peening. In addition, LPB could be performed using basic Computer Numeric Controlled (CNC) machines or robots, allowing for quick and easy integration into existing manufacturing facilities.

The partnership with NASA enabled the company to successfully commercialize the LPB process for aviation safety and biomedical uses. Lambda has received numerous additional SBIR contracts from other U.S. government agencies, including the Department of Defense and Department of Energy, extending applications for the process from aircraft engines and structures to nuclear welds and artillery.

Commercial Successes

In 2009, Lambda Technologies announced an exclusive partnering agreement with Delta Airlines to use the LPB process for the surface enhancement of commercial aircraft components, such as landing gear, propeller hubs, and turbine engine blades. They received Federal Aviation Administration (FAA) acceptance for both repair and alteration of commercial aircraft components.

For biomedical applications, Lambda Technologies partnered with Exactech, a Gainesville, Florida orthopedic implant maker. LPB has successfully eliminated fretting fatigue at the neck taper of hip implants. Data from the U.S. Food and Drug Administration confirmed that LPB completely eliminated the occurrence of fretting fatigue failures in modular hip implants.

In addition, the LPB process has completely eliminated fatigue failures in the first stage vanes on aircraft engines. LPB will save the U.S. Navy and Air Force millions of dollars each year in repair and maintenance costs and will make flight in high-damage areas like Afghanistan much safer for pilots and crew, by reducing the risk of engine failure due to foreign object damage.

In 2010, LPB received an R&D 100 award, recognizing this innovation as one of the 100 most technologically significant new products of the year. LPB is already saving millions of taxpayer dollars and making structural metallic components safer for passengers, pilots, workers, and soldiers. The method also improves the strength and safety of orthopedic implants, helping to enhance patients’ lives.

For More Information

If you would like additional information about Glenn’s technology transfer opportunities, please contact:

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<http://technology.grc.nasa.gov>